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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/588,647	06/15/2007	Kunihito Takaura	1091	9260

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EXAMINER	
ZHU, WEIPING	
ART UNIT	PAPER NUMBER
1734	

MAIL DATE	DELIVERY MODE
01/04/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/588,647	TAKAURA ET AL.	
	Examiner	Art Unit	
	WEIPING ZHU	1734	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 October 2011*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *8,9,13,16,17 and 19-22* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *8, 9, 13, 16, 17 and 19-22* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/GB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of Claims

1. Claims 8, 9, 13, 16, 17 and 19-22 are currently under examination, wherein claims 8 and 19-22 have been amended in applicant's amendment filed on October 24, 2011. Claims 10-12, 14, 15 and 18 have been cancelled by the applicant in the same amendment. The declaration under 37 CFR 1.132 filed on October 24, 2011 is acknowledged.

Status of Previous Rejections

2. The previous rejection of claim 17 under 35 U.S.C. 112, first paragraph; and the previous rejections of claims 8-23 under 35 U.S.C. 103(a) as stated in the Office action dated May 23rd, 2011 have been withdrawn in light of applicant's amendment filed on October 24, 2011. New grounds of rejections have been established as follows:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 8, 9, 13, 16, 17 and 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goudarzi el al. (US Pub. 2006/0021466 A1).

With respect to claims 8, 9, 15, 16 and 19-21, Goudarzi el al. ('466 A1) discloses a lead-free solder paste (paragraphs [0007]-[0015]) comprising a first solder alloy powder consisting of 2.3-4.3 wt.% Ag, at least one additional metal selected from the

group consisting of Cu, Zn, Bi, Ni, and In, and a balance of Sn (e.g. a Sn-Ag-In alloy or a Sn-Ag-In-Bi alloy as claimed in the instant claims 8, 9, 19 and 20); a second alloy powder consisting of more preferably 2.3-4.3 wt.% of Ag (indicating that the Ag content in the overall composition after melting is 2.3-4.3%) and a balance of Sn (e.g. a Sn-Ag alloy as claimed in the instant claim 9); and a flux, wherein the liquidus temperature (reading on the claimed main peak temperature measured by differential thermal analysis) of the first solder alloy is lower than that of the second solder alloy by not greater than 15°C as claimed in the instant claim 8.

Goudarzi el al. ('466 A1) does not specify the content of In in the overall composition as claimed in the instant claims 8 and 16; the content of In in the first solder alloy powder as claimed in the instant claims 8 and 20; and the content of Bi in the first solder alloy powder as claimed in the instant claims 8 and 21. However, one of ordinary skill in the art would expect that the contents of In or Bi in the overall composition and in the first solder alloy powder of Goudarzi el al. ('466 A1) would overlap the instantly claimed contents because the elements in the first and second solder alloy powders of Goudarzi el al. ('466 A1) (e.g. a Sn-Ag-In alloy or a Sn-Ag-In-Bi alloy as the first solder alloy powder and a Sn-Ag alloy as the second solder alloy powder) are the same as those in the instantly claimed first and second solder alloy powders; the contents of Ag in the first and second solder alloy powders of Goudarzi el al. ('466 A1) overlap the instantly claimed contents; and the difference in the liquidus temperatures of the first and second solder alloy powders required by Goudarzi el al. ('466 A1) which would obviously depend on the content of In or In and Bi to be added to the first solder alloy

powder overlaps the instantly claimed difference in the main peak temperatures. A prima facie case of obviousness exists. See MPEP 2144.05 I. The 0 mass % of the contents of Bi and Cu in the instant claim 8 does not require the presences of these elements.

With respect to claim 13, Goudarzi el al. ('466 A1) discloses that more preferably the second alloy comprises Sn and Ag (paragraph [0009]), suggesting that other elements can be included in the second alloy as desired. Goudarzi el al. ('466 A1) further discloses a solder paste comprising a Sn-Ag solder powder and additive powders comprising Sn, Ni, Cu, Ag and Bi (paragraph [0005]). It would have been obvious to one of ordinary skill in the art to add Cu or Bi and Cu to the second solder alloy of Goudarzi el al. ('466 A1) (i.e. the Sn-Ag alloy) as disclosed by Goudarzi el al. ('466 A1) (paragraph [0005]) in order to improve the properties of the lead-free solder as disclosed by Goudarzi el al. ('466 A1) (paragraphs [0003]-[0006]).

With respect to claim 17, Goudarzi el al. ('466 A1) discloses that the liquidus temperature of the first solder alloy is lower than that of the second solder alloy by not greater than 15°C (paragraph [0007]) without specifying the claimed range of at least 20°C. However, it is well held that discovering an optimum value of a result-effective variable involves only routine skill in the art. In re Boesch, 617, F.2d 272, 205 USPQ 215 (CCPA 1980). In the instant case, the liquidus temperature difference between the first and second solder alloy powders is a result effective variable, because it would directly affect reducing or eliminating undesirable tomb stoning effects during the reflow process as disclosed by Goudarzi el al. ('466 A1) (paragraph [0006]). Therefore, it

would have been obvious to one skilled in the art to have optimized the difference in order to reduce or eliminate undesirable tomb stoning effects during the reflow process. See MPEP 2144.05 II.

With respect to claim 22, the reasons for the rejections of claims 8, 13 and 21 as stated above are further applied.

Response to Arguments

4. The applicant's 1.132 declaration and arguments filed on October 24, 2011 have been fully considered but they are not persuasive.

The 1.132 declaration is insufficient to overcome the rejection of claim 8 based upon 35 U.S.C. 103(a) as being unpatentable over Goudarzi el al. ('466 A1) as set forth in the last Office action because: Goudarzi el al. ('466 A1)'s teaching of a Sn-Ag-In alloy rather than a Sn-Ag-Cu alloy as the first solder alloy has been relied upon as the ground of rejection. The maximum content of 5 wt.% In to be added as a fourth element to a Sn-Ag-Cu first solder alloy as disclosed by Goudarzi el al. ('466 A1) is not applicable to the In content in a Sn-Ag-In first solder alloy containing no Cu at all. The In content in the Sn-Ag-In first solder alloy of Goudarzi el al. ('466 A1) would only be limited by the required difference in the liquidus temperatures of the first and second solder alloys, which would overlap the instantly claimed In content range for the reasons discussed above.

First, the applicant argues that a Sn-Ag second solder alloy is the only option presented in Goudarzi el al. ('466 A1). In response, see the rejection of instant claim 13 above.

Second, the applicant argues that the Office action is misapplying the concept of basing an obviousness rejection on optimization of a variable; and Goudarzi el al. ('466 A1) teaches away from the difference in the main peak temperatures of the first and second solder alloys of at least 20°C as set forth in claim 17. In response, the examiner notes that the liquidus temperature difference between the first and second solder alloy powders is a result effective variable, because it would directly affect reducing or eliminating undesirable tomb stoning effects during the reflow process as disclosed by Goudarzi el al. ('466 A1) (paragraph [0006]). Therefore, it would have been obvious to one skilled in the art to have optimized the difference in order to reduce or eliminate undesirable tomb stoning effects during the reflow process. See MPEP 2144.05 II. Goudarzi el al. ('466 A1)'s motivation to optimize the difference does not have to be the same as that of the instant invention and therefore the results of the optimization of Goudarzi el al. ('466 A1) do not have to be the same as that of the instant invention. The application of MPEP 2144.05 II is proper as long as the difference is a result-effective variable. Furthermore, it is well held that mere disclosure of alternative designs does not constitute a teaching away. See In re Fulton, 391 F. 3d 1195, 1201, 73 USPQ2d 1141, 1146 (Fed. Cir. 2004).

Third, the applicant argues that Goudarzi el al. ('466 A1) does not teach that the liquidus temperature of the first solder alloy is lower than that of the second solder alloy. In response, the examiner notes that Goudarzi el al. ('466 A1) discloses a Sn-Ag-In first solder alloy and a Sn-Ag second solder alloy as discusses above. The liquidus

temperature of the first solder alloy would obviously lower than that of the second solder alloy because the melting point of In is much lower that those of Sn and Ag.

Fourth, the applicant argues that the Office action is improperly using the instant application as a guide to determine the In and Bi contents in the solder alloys of Goudarzi el al. ('466 A1). In response, the examiner notes that the In and Bi contents in the solder alloys of Goudarzi el al. ('466 A1) would only be determined by the difference in the liquidus temperatures of a Sn-Ag-In or Sn-Ag-In-Bi first solder alloy and a Sn-Ag second solder alloy required by Goudarzi el al. ('466 A1) as discussed above.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Weiping Zhu whose telephone number is 571-272-6725. The examiner can normally be reached on 8:30-16:30 Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Emily Le can be reached on 571-272-0903. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Weiping Zhu/
Examiner, Art Unit 1734

/Emily M Le/
Supervisory Patent Examiner, Art Unit 1734
12/20/2011